

## Solving Word Problems Using Equations

- For each problem, make sure you set up the equation AND tell me what  $x$  stands for.
- Make sure you answer each question with a complete sentence
- Make sure you show your work and don't skip steps.
- Check all of your answers. (Plug it back in).

Distance, rate (speed), and time: Remember that  $distance = rate \cdot time$  ( $d = rt$ )

1. Mr. Maurer ran for 2 hours and he ran 10 miles. How fast did he run, on average?

$$\frac{10}{2} = \frac{x \cdot 2}{2} \quad x = \text{speed/rate}$$

$$\frac{10 \text{ miles}}{2 \text{ hours}} = 5 \text{ mph}$$

2. Sometimes, Mr. Maurer bikes to Mt. Tabor and runs around there. The other day, he biked for 6 miles from home to Mt. Tabor, ran for an hour at Mt. Tabor, and then biked 6 miles back home. The total distance that he traveled was 16 miles. How fast did he run at Mt. Tabor?

$$16 = 6 + 1 \cdot x + 6$$

$$16 = 12 + 1x$$

$$4 = 1 \cdot x$$

He ran 4 mph at Mt. Tabor

3. How fast was Mr. Maurer biking if he bikes 3 miles in 15 minutes?

$$d = rt \rightarrow 3 \text{ miles} = r \cdot 15 \text{ min}$$

$$\frac{3}{15} = r$$

$$0.2 = r$$

2 miles per minute  
 $0.2 \cdot 60 = 12 \text{ miles per hour}$

4. The other day Mr. Maurer was walking home from Cleveland when he spotted one of those scooters laying around. He put on his helmet (safety first) and then scooted the rest of the way home. He had already walked 1 mile when he saw the scooter, and it took him 10 minutes to scoot the rest of the way home. He lives 3 miles from Cleveland. How fast was he scooting?

$$d = r \cdot t$$

$$3 = 1 + r \cdot 10$$

$$2 = r \cdot 10$$

$$\frac{2}{10} = r$$

$r = 0.2$  miles per minute  
 $r = 12 \text{ mph}$



**Other word problems: Remember that what you don't know is "x". The question tells you what your variable is.**

5. A T-Shirt design company charges a \$12 design fee and \$4 per t-shirt. If you spend \$60 total, how many T-Shirts did you purchase?  $x = \# \text{ of T-shirts}$

$$\begin{array}{r} 12 + 4x = 60 \\ -12 \phantom{+ 4x} \\ \hline 4x = 48 \\ \phantom{4x} \div 4 \\ \hline x = 12 \end{array}$$

Purchased 12 T-shirts

6. A baby tree grows 3 inches each week and was 1.5 feet tall when I bought it. When will it be 3 feet tall?  $x = \# \text{ of weeks}$

$$\begin{array}{r} 3 \text{ ft} = 3 \text{ in}x + 1.5 \text{ ft} \\ 36 \text{ in} = 3 \text{ in}x + 18 \text{ in} \\ -18 \phantom{+ 3 \text{ in}x} \\ \hline 3 \text{ in}x = 18 \text{ in} \\ \phantom{3 \text{ in}x} \div 3 \\ \hline x = 6 \end{array}$$

In 6 weeks

7. A 6 ft board is cut into two pieces, one twice as long as the other. How long are the pieces?  $x = \text{smaller piece}$

$$\begin{array}{r} x + 2x = 6 \\ \phantom{x +} \div 3 \\ \hline x = 2 \end{array}$$

The pieces are 2 ft & 4 ft long.

8. A right triangle has one acute angle of 43. What is the measure of the other acute angle? (Remember the definition of "right triangle"? Remember what the angles add up to?)  $x = \text{other angle}$

$$\begin{array}{r} 90 + 43 + x = 180 \\ -90 \phantom{+ 43} \phantom{+ x} \\ \hline 43 + x = 90 \\ -43 \phantom{+ x} \\ \hline x = 47 \end{array}$$

9. Another right triangle has one acute angle that is twice as big as its other acute angle. What are the three angles in the triangle?  $x = \text{small angle}$

$$\begin{array}{r} x + 2x + 90 = 180 \\ \phantom{x +} \div 3 \\ \hline x = 30 \end{array}$$

30, 60, 90

10. Another right triangle has one acute angle that is 10 more than 2 times the other acute angle. What are the three angles in the triangle?  $x = \text{small angle}$

$$\begin{array}{r} x + 2x + 10 + 90 = 180 \\ \phantom{x +} \div 3 \\ \hline x = 26.\bar{6} \end{array}$$

26. $\bar{6}$ , 63. $\bar{3}$ , 90

## Extension:

A) Solve this problem by defining a variable and solving an equation. Write your solution in a sentence.

- a) Wenatchee High School's population is 250 students fewer than twice the population of East Wenatchee High School. The two schools have a total of 2858 students. How many students attend East Wenatchee High School?

$$x = \# \text{ of East Wenatchee students}$$

$$x + 2x - 250 = 2858$$

$$3x - 250 = 2858$$

$$3x = 3108$$

$$x = 1036$$

1036 students attend East Wenatchee

B)  $-2(x-3) + 4x = -(-x+1)$

$$-2x + 6 + 4x = x - 1$$

$$\underbrace{2x + 6}_{-x} = \underbrace{x - 1}_{-x}$$

$$x + 6 = -1$$

$$x = -7$$

C)  $3(5x+2) = 8x+20$

$$15x + 6 = 8x + 20$$

$$\underbrace{15x + 6}_{-8x} = \underbrace{8x + 20}_{-8x}$$

$$7x + 6 = 20$$

$$\underbrace{7x + 6}_{-6} = \underbrace{20}_{-6}$$

$$\frac{7x}{7} = \frac{14}{7} \rightarrow x = 2$$